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Shell morphology of some freshwater snails of the Family *Ampullariidae* from paddy fields in Fanchan, Dawakin kudu, local Government area of Kano state, Nigeria

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Abstract: The morphology of the shells of different large fresh water snails collected from Fanchan paddy fields in July and August at the heights of the rainy season was studied in order to identify the snails. All the one hundred and fifty snails are made up of different species of the family *Ampullariidae*. Most of the snails were found attached to rice plants and were collected by handpicking. Morphometric readings were taken using a digital vernier caliper. Their heights range from 13.1 to 66.8mm. Fadama has the highest average shell height (48.92 mm). Fanchan Right has the lowest average (33.11 mm) while Fanchan Left has 40.31 mm. The highest value for shell height, shell width, spire height, aperture length, Aperture width, were recorded in Fadama. While the least value for all of these morphometric characters were obtained from Fanchan right. Power BI was used to plot the bar chart to show averages of shell height and shell widths for the three locations where the snails were collected from. These results might reflect differences in environmental conditions, nutrition availability, or other factors that affect shell growth at the different locations. There is need for more research on these snails for proper identification and control strategy.

Keywords: *Ampullariidae*, Freshwater habitat, paddy fields, Morphometry, Fanchan
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INTRODUCTION

It is a well-known fact that water bodies harbor freshwater snails that serve many purposes in the ecosystem. Snails are gastropod mollusks and are found throughout the world in different habitats which include rain fed pools, pond, drainages, dams, lakes and streams [1]. The freshwater snail family *Ampullariidae* includes nine extant genera (Hayes *et al*., 2015; Cowie, 2015). Ponder and Warén 1988, Ponder and Lindberg 1997, Simone, 2004 reported that four genera of the family *Ampullariidae* occur in West Africa and are associated with swamps and slowly flowing rivers and streams, some species occur in seasonal waters that dry out for many months. Three of these genera, *Pomacea*, *Pila*, and *Marisa*, have been labeled as invasive in places where they have been introduced (Joshi, 2017) destroying rice plants and in the process causing low yields. Apple snails range greatly in size, the shell of *P. maculata* has been reported to reach 17 cm in maximum dimension (Cowie *et al*., 2006). But according to Simone (2004) adults of P. *curumin*, rarely grow larger than the size of *P. urceus* (Müller, 1774) hatchlings which is 10.5 mm on average (Burky, 1974; Simone, 2004). This work aims to determine the characteristic shell dimensions of *Ampullariidae* snails collected from paddy fields in Fanchan. There is a dearth of information on *Ampullariidae* snails of Nigerian origin.

MATERIALS AND METHODS

Study Area

This study was conducted in Fanchan, Dawakin kudu local government area, Kano state, Nigeria adjacent to some part of River Hadejia. Fanchan locations lies at lat. 11°46'13.3"N and long. 8°42'43.7" and mean altitude of 440.27m above sea level. Dawakin Kudu L G shares boundaries with Kumbotso Local Government to the Northwest, Gezawa Local Government to the north east, Warawa Local Government to the east, Wudil Local Government Area to the south east, Bunkure Local

Government Area to south and Kura Local Government Area to the southwest. Dawakin Kudu Local Government Area falls within Kano central as well as Sudan savanna agro-ecological zone of Nigeria (Kutama *et al*., 2010). The climate of the area is described as tropical climate, which is characterized by two distinct seasons, the dry and rainy season with temperature that is hot during the dry season and cool during the rainy season, from November to February the cold dry harmattan wind blows across the district. Generally, the rains start in April and end in October. The area has tropical grassland (savannah). The people of this area (Fanchan) are Hausa and Fulani and most of them are farmers and fishermen, they cultivate Sorghum, Millet, Rice, Groundnuts, Cowpea and Maize, sugar cane including vegetables. They use water from River Hadejia for irrigation during the dry season.

Figure 1: Map of Dawakin Kudu local government area showing the study areas

Snail collection

Snails were searched for from three different parts of Fanchan bearing rice farms at the bank of the river (River Hadejia) and environs fortnightly between December 2023 and August 2024 from 10 am and 1 pm. Snails were collected by hand-picking in the rice farms and environs in July and August. They were taken to the biological science laboratory of the Nigeria Police Academy, Wudil in a plastic container containing water from the location, washed and grouped for morphometric readings where shell height, width, aperture height, width, spire length etc were taken.

Statistical Analysis

Data for all samples from each location were subjected to One-way analysis of variance using XL Miner Analysis Toolpak which is a Microsoft Excel ad-in to assess whether the mean shell heights and widths between locations were significant among the snail samples. ;Power BI was used to plot the bar chart to show averages of shell height and shell widths for three locations where the samples were acquired.

RESULTS

All the one hundred and fifty (150) large freshwater snails collected belong to the family *Ampullariidae* and are from paddy fields. The shell coils to the right when the apex is uppermost and the opening called aperture is to the right. The shell can be yellowish brown in color, or dark brown with spiral bands, sometimes without spiral bands. They also have an operculum which closes the opening of the shell. There are two pairs of long and tapering tentacles, gills and a lung. Measurements on the shell showed that the snail with the highest height (66.8mm) was found in Fadama and the one with the shortest height (13.1mm) was found in Fanchan right. Widths are between 60.1 and 12mm. Twenty snails were collected in Fadama and the mean shell height is about 48.92 mm.

The Variance (152.79) indicates there is a high degree of variability in shell height measurements within this group. Forty-three snails were collected in Fanchan right. The mean shell height of 33.11 indicates that the mean shell height in Fanchan Right is smaller compared to Fadama, at 33.11 mm. Variance (101.52) shows less variability compared to Fadama but still a substantial amount of spread. This location has a lower mean shell height and somewhat lower variability compared to Fadama, meaning the samples in this group tend to be shorter on average, and there's less fluctuation between individual measurements. In Fanchan Left the ANOVA focuses again on shell height also, eighty-seven snails, with a mean shell height of about 40.31 mm. and a Variance of 120.96, show moderate variability, higher than Fanchan Right but lower than Fadama. This location has a higher mean shell height than Fanchan Right but lower than Fadama, and the variability is also moderate. This indicates that shell height is largest in Fadama and smallest in Fanchan Right, possibly suggesting differences in environmental conditions affecting shell growth.

Figure .2: Some representatives of snails collected in Fanchan

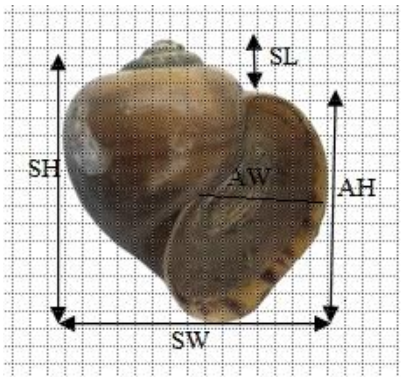

Figure 3: Measurements made on shells of *Ampullariidae* snails

Table 1: Locations and measurement ranges of five characters on *Ampullariidae* snails

Morphometric characters	Fadama (20)	Fanchan; right (43)	Fanchan left (87)
SH	27.3 -66.8	13.1- 55.1	17.1 -61.3
SW	23 – 60.1	12 -50.1	14.9 -57.5
AH	20.6 -48	9.8-41	13.6 -48.9
AW	12.4 – 33	6.4-23.8	7.5-27.1
SL	5.5-18.5	2.8-16	3.6-17.3

All measurements in mm: SH, shell height; SW, shell width; AH, aperture height; AW, aperture width; SL, Spire length. No. of snails in parenthesis.

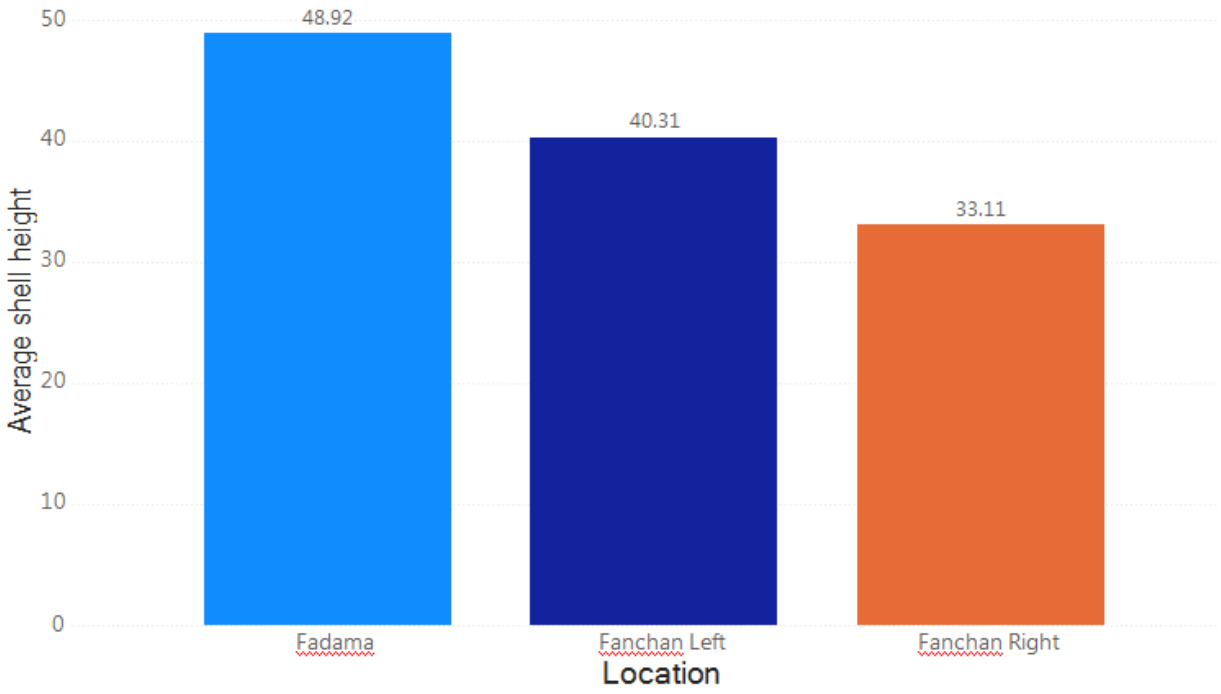

Figure 4: Relationship of shell height and location

DISCUSSION

There is a need for the identification of snails because of the role they play in the environment. It is not known whether these snails are natives or non-natives since there are no previous records of snail investigation or reports in the study area. It was first reported in Kano (Duwa, 2018), although no morphometric study was carried out on the snails collected. The snails collected have the same morphological characteristics as some snails reported elsewhere as invasive apple snails (Josh, 2017). Naming of snails can only be made after molecular studies have been carried out. The fact that no other snail family was found showed that these snails are invasive and must have displaced other snail species. The fact also that they are found attached to the roots of rice plants shows that they are feeding on rice plants and can, therefore, reduce yield. Shell character metric measurements were used to analyse possible variations among three populations of Ampullaeiidae snails from the paddy fields of Fanchan. Morphometric studies can be used for differentiating *Molluscan* species by contrasting overall features of shell measurement (Stone, 1998). This study was not carried out on a particular genus since there was no identification study yet. The only identifying factor is their large size, colour and dexterity. In this study, there is no group specification as this is the first time morphometric readings of *Ampullariidae* snails of Nigerian origin were taken, and reported and the snails have not been identified. Estebenet and Martin, 2003; Rawlings *et al*., 2007 have reported many intraspecific differences for *Pomacea* spp.

CONCLUSION

There has been no report of snails with morphometric values as high as those obtained in the present study in Kano state or Nigeria in general. The highest values for shell length, shell width, aperture length, aperture width and spire height and width were recorded in Fadama. While the lowest value for all these morphometric characters was recorded from Fanchan's right. These findings are important in creating awareness of the presence of these freshwater snails and their impact on rice farms and preparing a control strategy.

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